

Having described the invention, the following is claimed:

1. A method comprising the steps of engaging a surface area on body tissue with a leading end portion of a member which extends through an anchor engaged by a suture, piercing the surface area on the body tissue with the leading end portion of the member while the leading end portion of the member extends through the anchor, and moving the leading end portion of the member and the anchor together into an opening formed in the body tissue during performance of said step of piercing the body tissue with the leading end portion of the member.

2. A method as set forth in claim 1 wherein said step of moving the leading end portion of the member and the anchor together into the opening formed in the body tissue includes transmitting force from the member to a trailing end of the anchor to move the anchor into the body tissue.

3. A method as set forth in claim 1 further including the steps of inserting a suture through an opening in the anchor, and inserting the leading end portion of the member into the opening in the anchor with the suture in the opening in the anchor.

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4. A method as set forth in claim 1 wherein said step of engaging the surface area on the body tissue with the leading end portion of the member includes engaging the surface area on body tissue with a pointed end of the member, said step of piercing the surface area on the body tissue includes initiating the formation of an opening in the surface area on the body tissue with the pointed end of the member.

5. A method as set forth in claim 1 wherein said step of moving the leading end portion of the member and the anchor together into an opening formed in the body tissue includes pressing a pusher surface against an end surface on the anchor and moving the anchor into the opening under the influence of force applied against the end surface on the anchor by the pusher surface.

6. A method as set forth in claim 1 further including the step of withdrawing the leading end portion of the member from the anchor after moving the leading end portion of the member and the anchor together into the opening formed in the body tissue.

7. A method as set forth in claim 6 further including step of changing the orientation of the anchor relative to the leading end portion of the member as the

leading end portion of the member is withdrawn from the anchor.

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8. A method as set forth in claim 7 wherein said step of changing the orientation of the anchor relative to the leading end portion of the member includes tensioning the suture.

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9. A method as set forth in claim 8 wherein said step of changing the orientation of the anchor includes applying force against a trailing end surface of the anchor.

10. A method as set forth in claim 1 further including step of disengaging the anchor from the leading end portion of the member with the anchor in the body tissue, said step of disengaging the anchor from the leading end portion of the member includes applying force against an end of the anchor.

11. A method as set forth in claim 10 wherein said step of applying force against the end of the anchor includes moving a force transmitting surface relative to the member in a direction toward a leading end of the member.

12. A method as set forth in claim 1 wherein the leading end portion of the member includes a pointed end, said method further including the steps of moving the pointed end of the member through the anchor so that the pointed end of the member projects from a first side of the anchor and moving a pusher surface into engagement with a second side of the anchor which is opposite from the first side of the anchor.

13. A method as set forth in claim 12 wherein said step of piercing the surface area on the body tissue includes initiating the formation of an opening in the body tissue with the pointed end of the member.

14. A method as set forth in claim 13 wherein said step of moving the leading end portion of the member and the anchor together into an opening formed in the body tissue includes applying force against the second side of the anchor with the pusher surface.

15. A method of positioning a suture anchor in body tissue, said method comprising the steps of providing an anchor which engages a suture and has a passage which extends between first and second surface areas on the anchor, providing a member having an end portion which extends through the passage in the anchor to a position in which the end portion of the member extends a first

distance from the first surface area on the anchor, moving the anchor into body tissue with the first surface area on the anchor leading, said step of moving the anchor into body tissue being performed with the end portion of the member extending the first distance ahead of the first surface area on the anchor and with the suture engaging the anchor, and, thereafter, separating the member and the anchor while the anchor remains in the body tissue in engagement with the suture by moving the end portion of the member out of the passage in the anchor.

16. A method as set forth in claim 15 further including the steps of applying force against the second surface area on the anchor during performance of said step of moving the anchor into body tissue.

17. A method as set forth in claim 15 wherein said step of moving the anchor into body tissue includes moving a pusher surface and the end portion of the member together relative to the body tissue, transmitting force from the pusher surface to the second surface area on the anchor, and pressing the first surface area on the anchor against the body tissue under the influence of force transmitted to the second surface area on the anchor from the pusher surface.

18. A method as set forth in claim 17 wherein said step of separating the member and the anchor includes moving the pusher surface relative to the member in a direction toward the end portion of the member.

19. A method as set forth in claim 17 wherein said step of separating the member and the anchor includes moving the end portion of the member and the pusher surface together away from the anchor.

20. A method as set forth in claim 15 wherein said step of moving the anchor into body tissue includes a applying force against an inner side surface of the passage in the anchor with a spring, said step of separating the member and the anchor includes flexing the spring to reduce force applied against the inner side surface of the passage in the anchor by the spring.

21. A method as set forth in claim 15 wherein said step of separating the member and the anchor includes transmitting force from a pusher surface to the second surface area on the anchor and moving the pusher surface relative to the member in a direction toward the end portion of the member.

22. A method as set forth in claim 21 wherein said step of moving the pusher surface relative to the member

includes sliding a pusher element on which the pusher surface is disposed along the member in a direction toward the end portion of the member.

23. A method as set forth in claim 15, wherein the suture extends through the passage in the anchor, said method further includes changing the orientation of the anchor relative to the member while the end portion of the member is disposed in the passage in the anchor along with the suture.

24. A method of positioning a suture anchor in body tissue, said method comprising the steps of providing an anchor which has a passage which extends between first and second surface areas on the anchor, providing an inserter having an end portion and a pusher surface which is spaced from the end portion, and moving the anchor and inserter together into body tissue with the end portion of the inserter extending into the passage in the anchor and the pusher surface on the inserter engaging the second surface area on the anchor, said step of moving the anchor and inserter together into the body tissue includes transmitting force from the pusher surface on the inserter to the second surface area on the anchor.

25. A method as set forth in claim 24 further including the step of separating the inserter and the

anchor after performing said step of moving the anchor and inserter together into body tissue, said step of separating the inserter and the anchor includes moving the end portion of the inserter out of the passage in the anchor.

3 26. A method as set forth in claim ~~25~~² wherein said step of separating the anchor and the inserter includes moving the pusher surface toward the end portion of the inserter.

4 27. A method as set forth in claim ~~25~~² wherein said step of separating the inserter and the anchor includes applying force against the second surface area on the anchor and moving the anchor relative to the end portion of the inserter under the influence of the force applied against the second surface area on the anchor.

28. A method as set forth in claim ~~24~~ wherein said step of moving the anchor and inserter together into body tissue is performed with a suture extending through the passage in the anchor.

5 29. A method as set forth in claim ~~24~~¹ wherein said step of moving the anchor and inserter together into body tissue includes initiating the formation of an opening in a surface area on the body tissue with the end portion of the

inserter at a location ahead of the first surface area on the anchor.

6 30. A method as set forth in claim 24 wherein said step of moving the anchor and inserter together into body tissue includes penetrating the body tissue with the end portion of the inserter at a location ahead of the first surface area on the anchor.

7 31. A method as set forth in claim 24 further including the step of inserting a suture through an opening in the anchor, said step of moving the anchor and inserter together into body tissue is performed with the suture extending through the opening in the anchor.

32. A method as set forth in claim 24 further including the steps of separating the inserter and the anchor after having performed said step of moving the anchor and inserter together into body tissue and changing the orientation of the anchor relative to the inserter.

8 33. An apparatus comprising an anchor having a passage which extends between first and second surface areas on the anchor, a suture disposed in engagement with said anchor, a manually engageable handle, and a shaft extending from said handle through the passage in said anchor, said shaft having a pointed end which extends away

from the first surface area on said anchor in a direction away from said handle, said shaft having a pusher surface which is spaced from the pointed end of said shaft by a distance which is the same as a distance between the first and second surface areas on said anchor, said pointed end of said shaft being effective to penetrate body tissue in advance of said anchor and said pusher surface being effective to apply force against the second surface area on said anchor upon insertion of said anchor into body tissue.

34. An apparatus as set forth in claim 33 wherein said pusher surface is fixedly connected with said pointed end of said shaft.

9 35. An apparatus as set forth in claim 33 wherein said pusher surface is movable relative to said pointed end of said shaft to move said anchor relative to said pointed end of said shaft.

36. An apparatus as set forth in claim 33 wherein said suture extends through at least a portion of the passage in said anchor.

37. An apparatus as set forth in claim 33 further including a spring which is connected with said shaft, said spring being movable relative to said shaft between a first position in which a portion of said spring engages an inner

side surface of the passage in said anchor and a second position, said spring being effective to retain said anchor against movement relative to said shaft when said spring is in the first position, said spring being ineffective to retain said anchor against movement relative to said shaft when said spring is in the second position.

38. An apparatus as set forth in claim 33 wherein said shaft includes a longitudinally extending inner section and an outer section which at least partially encloses and is movable along said inner section, said inner section having an end portion which is connected with said handle, said pointed end of said shaft being disposed on an end portion of said inner section which is opposite from the end portion of said inner section which is connected with said handle, said pusher surface being disposed on said outer section of said shaft.

39. An apparatus as set forth in claim 33 further including a member which is movable relative to said shaft to move said anchor relative to said pointed end of said shaft.

10 / 40. An apparatus for use in positioning a suture anchor relative to body tissue, said apparatus comprising a handle, an inner member having a first end portion fixedly connected with said handle and a second end portion which

is spaced from said handle, said second end portion of said inner member being at least partially disposed in a passage in the anchor during insertion of the anchor into body tissue, and a tubular outer member at least partially enclosing said inner member, said outer member being slidable along said inner member between a retracted position in which an end surface on said outer member is spaced a first distance from said handle and an extended position in which the end surface on said outer member is spaced a second distance from said handle, said second distance being greater than said first distance, said end surface on said outer member being engageable with a first end portion of the anchor having a passage into which said inner member extends to block movement of the anchor along said inner member toward said handle during insertion of the anchor into body tissue with said outer member in the retracted position.

11 41. An apparatus as set forth in claim 40¹⁰ wherein said second end portion of said inner member has surface means which extends outward from a second end portion of the anchor to penetrate body tissue ahead of the anchor during insertion of the anchor into body tissue with said outer member in the retracted position and said inner member partially disposed in the passage in the anchor.

12 42. An apparatus as set forth in claim 41 wherein said surface means on said second end portion of said inner member has a generally conical configuration and has a central axis which is coincident with a central axis of said inner member.

13 43. An apparatus as set forth in claim 40 wherein a first length of said inner member and a first length of said outer member are disposed in said handle in a telescopic relationship when said outer member is in the retracted position, a second length of said inner member and a second length of said outer member being disposed in said handle in a telescopic relationship when said outer member is in the extended position, said second length of said inner member and said second length of said outer member being shorter than said first length of said inner member and said first length of said outer member so that the extent of the telescopic relationship in said handle between said inner and outer members is greater when said outer member is in the retracted position than when said outer member is in the extended position.

44. An apparatus for use in anchoring a suture in body tissue with an anchor having a passage which extends between first and second surface areas on the anchor, said apparatus comprising a handle, and a shaft connected with said handle, said shaft extends outward from said handle

and extends through the passage in the anchor during insertion of the anchor into body tissue, said shaft having end surface means for piercing body tissue ahead of the first surface area on the anchor during insertion of the anchor into body tissue, said shaft having pusher surface means for transmitting force to the second surface area on the anchor to push the anchor during insertion of the anchor into body tissue.

45. An apparatus as set forth in claim 44 wherein said shaft has positioning surface means for engaging an inner surface of the passage in the anchor to position the anchor relative to said pusher surface means and said end surface means, said positioning surface means extends through the passage in the anchor during insertion of the anchor into body tissue to position the anchor relative to said pusher surface means and said end surface means, said positioning surface means having an axial extent along a longitudinal central axis of said shaft equal to a distance between the first and second surface areas on the anchor.

86 46. An apparatus as set forth in claim 45 wherein said shaft includes an inner member which is connected with said handle and an outer member which at least partially encloses said ^{inner} outer member and is movable relative to said ^{inner} outer member, said pusher surface means being disposed on said outer member and being movable with said outer member

relative to said inner member, said end surface means being disposed on said inner member, said positioning surface means being disposed on said inner member, said pusher surface means being movable along said positioning surface means upon relative movement between said inner and outer members.

47. An apparatus as set forth in claim 44 wherein said shaft is integrally formed as one piece, said pusher surface means being disposed on said shaft in a fixed relationship with said end surface means.

48. An apparatus as set forth in claim 44 further including a member which extends along and is movable relative to said shaft, said pusher surface means being disposed on said member which is movable along said shaft.

49. An apparatus as set forth in claim 44 further including a spring which is resiliently deflectable to move relative to said shaft between an engaged position in which said spring engages the inner surface of the passage in the anchor to retain the anchor against movement relative to said shaft and a disengaged position in which said spring is ineffective to retain the anchor against movement relative to said shaft.

50. An apparatus as set forth in claim 44 wherein said end surface means is pointed and has a generally conical configuration, and said pusher surface means has a generally annular configuration, said pointed end surface means and pusher surface means being disposed in a coaxial relationship.

51. An apparatus as set forth in claim 44 further including actuator means disposed adjacent to said handle and connected with said pusher surface means for moving said pusher surface means relative to said handle to move the anchor away from said handle and facilitate disengagement of the anchor from said shaft.

52. An apparatus as set forth in claim 44 wherein said pusher surface means is movable relative to said end surface means to move the anchor relative to said shaft to facilitate disengagement of the anchor from said shaft during insertion of the anchor into body tissue.

109 53. An apparatus as set forth in claim 52 further including actuator means disposed adjacent to said handle and connected with said pusher surface means, said actuator means being movable relative to said handle to move said pusher surface means relative to said end surface means.

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14/ 54. A method of positioning a suture anchor in body tissue, said method comprising the steps of providing an inserter having a shaft with an end portion which extends into a passage in the anchor, moving the anchor into body tissue with the end portion of the shaft extending into the passage in the anchor and with a suture disposed in engagement with the anchor, and, thereafter, changing the orientation of the anchor relative to the body tissue and shaft while the end portion of the shaft is at least partially disposed in the passage in the anchor.

15/ 55. A method as set forth in claim 54 ¹⁴ wherein said step of changing the orientation of the anchor relative to the body tissue and shaft includes tensioning the suture to apply force to the anchor and engaging an inner side surface of the passage in the anchor with the end portion of the shaft.

16/ 56. A method as set forth in claim 54 ¹⁴ further including the step of reducing the extent to which the shaft extends into the passage in the anchor after moving the anchor into body tissue and prior to performance of said step of changing the orientation of the anchor relative to the body tissue and shaft.

17/ 57. A method as set forth in claim 54 ¹⁴ wherein said step of moving the anchor into body tissue includes

applying force against a trailing end surface of the anchor with a surface connected with the shaft of the inserter, said method further including the step of applying force against the trailing end surface of the anchor to move the anchor along the shaft of the inserter after moving the anchor into body tissue and prior to performance of said step of changing the orientation of the anchor relative to the body tissue and shaft.

18 58. A method as set forth in claim ¹⁴54 wherein said step of moving the anchor into body tissue includes piercing an imperforate surface area on the body tissue with the end portion of the shaft while the end portion of the shaft extends into the passage in the anchor.

19 59. A method as set forth in claim ¹⁸58 wherein said step of moving the anchor into body tissue further includes applying force against a trailing end surface of the anchor with the shaft to move a leading end surface of the anchor through an opening formed in the body tissue by piercing the body tissue with the end portion of the shaft.

20 60. A method as set forth in claim ¹⁴54 wherein said step of changing the orientation of the anchor relative to the body tissue and shaft includes transmitting force through the suture to a first end portion of the anchor and applying force against an inner side surface of the passage

in the anchor with the end portion of the shaft at a location adjacent to a second end portion of the anchor.

61. A method of positioning a suture anchor in body tissue, said method comprising the steps of providing an inserter having a shaft with an inner member and an outer member which partially encloses and which is movable relative to the inner member, said inner member having an end portion which extends outward from an end surface on the outer member and extends into the anchor, moving the anchor into body tissue with the inner member extending into the anchor and with the suture disposed in engagement with the anchor, said step of moving the anchor into body tissue includes transmitting force from the end surface on the outer member to a trailing end portion of the anchor, and, thereafter, separating the anchor and the outer member while the anchor remains in the body tissue, said step of separating the anchor from the outer member includes effecting relative movement between the inner and outer members while transmitting force between the trailing end portion of the anchor and the end surface on the outer member to decrease the extent to which the end portion of the inner member extends outward from the end surface on the outer member.

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62. A method as set forth in claim 61 wherein said step of moving the anchor into body tissue includes

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piercing the body tissue with the end portion of the inner member at a location ahead of the anchor.

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63. A method as set forth in claim 61 wherein said step of moving the anchor into body tissue includes moving the anchor and the inner and outer members of the inserter into body tissue with the end portion of the inner member leading the anchor.

64. A method as set forth in claim 61 further including the step of changing the orientation of the anchor relative to the body tissue and shaft of the inserter while performing said step of separating the anchor from the outer member, said step of changing the orientation of the anchor relative to the body tissue includes transmitting force between the end portion of the inner member and an inner surface of the anchor while transmitting force through the suture to the anchor.

21 65. An apparatus for use in anchoring a suture in body tissue with an anchor having a passage which extends into the anchor, said apparatus comprising a handle, a shaft connected with said handle, said shaft extends outward from said handle and extends into the passage in the anchor during insertion of the anchor into body tissue, said shaft having a pusher surface which applies force against a trailing end portion of the anchor during

insertion of the anchor into body tissue, and a pusher member which is movable relative to said shaft through an opening in said pusher surface to apply force against the trailing end portion of the anchor and effect relative movement between the anchor and said shaft with the anchor disposed in the body tissue to thereby facilitate separation of the anchor from said shaft.

22/ 66. An apparatus as set forth in claim 65²¹ wherein said shaft is integrally formed as one piece, said pusher surface being disposed on said shaft in a fixed relationship with said shaft, said pusher member being movable relative to said shaft along a path which extends parallel to a longitudinal central axis of said shaft to apply force against the trailing end portion of the anchor.

23/ 67. An apparatus as set forth in claim 65²¹ wherein said pusher member is at least partially disposed in a passage formed in said shaft.

24/ 68. An apparatus as set forth in claim 65²¹ further including a spring which is connected with said shaft, said spring being movable relative to said shaft between a first position in which a portion of said spring engages an inner side surface of the passage in the anchor and a second position, said spring being effective to retain the anchor against movement relative to said shaft when said spring is

in the first position, said spring being ineffective to retain the anchor against movement relative to said shaft when said spring is in the second position.

25/ 69. An apparatus as set forth in claim 65/ wherein said shaft has a pointed end portion which extends ahead of a leading end portion of the anchor to pierce body tissue during inserting of the anchor into body tissue.

26/ 70. An apparatus for use in anchoring a suture in body tissue with an anchor having a passage which extends into the anchor, said apparatus comprising a handle, a shaft connected with said handle, said shaft extends outward from said handle into the passage in the anchor during insertion of the anchor into body tissue, and a spring which is connected with said shaft, said spring being movable relative to said shaft between a first position in which a portion of said spring engages an inner side surface of the passage in the anchor and a second position, said spring being effective to retain the anchor against movement relative to said shaft when said spring is in the first position, said spring being ineffective to retain the anchor against movement relative to said shaft when said spring is in the second position.

21/ 71. An apparatus as set forth in claim 70/ wherein said shaft has a pusher surface which is fixedly connected

with said handle and which applies force against a trailing end portion of the anchor during insertion of the anchor into body tissue, said apparatus further including a pusher member which is movable relative to said shaft through an opening in said pusher surface to apply force against the trailing end portion of the anchor and effect relative movement between the anchor and said shaft with the anchor disposed in the body tissue to thereby facilitate separation of the anchor from said shaft.

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72. An apparatus as set forth in claim 70 wherein said shaft has a pointed end portion which extends ahead of a leading end portion of the anchor to pierce body tissue during insertion of the anchor into body tissue.

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